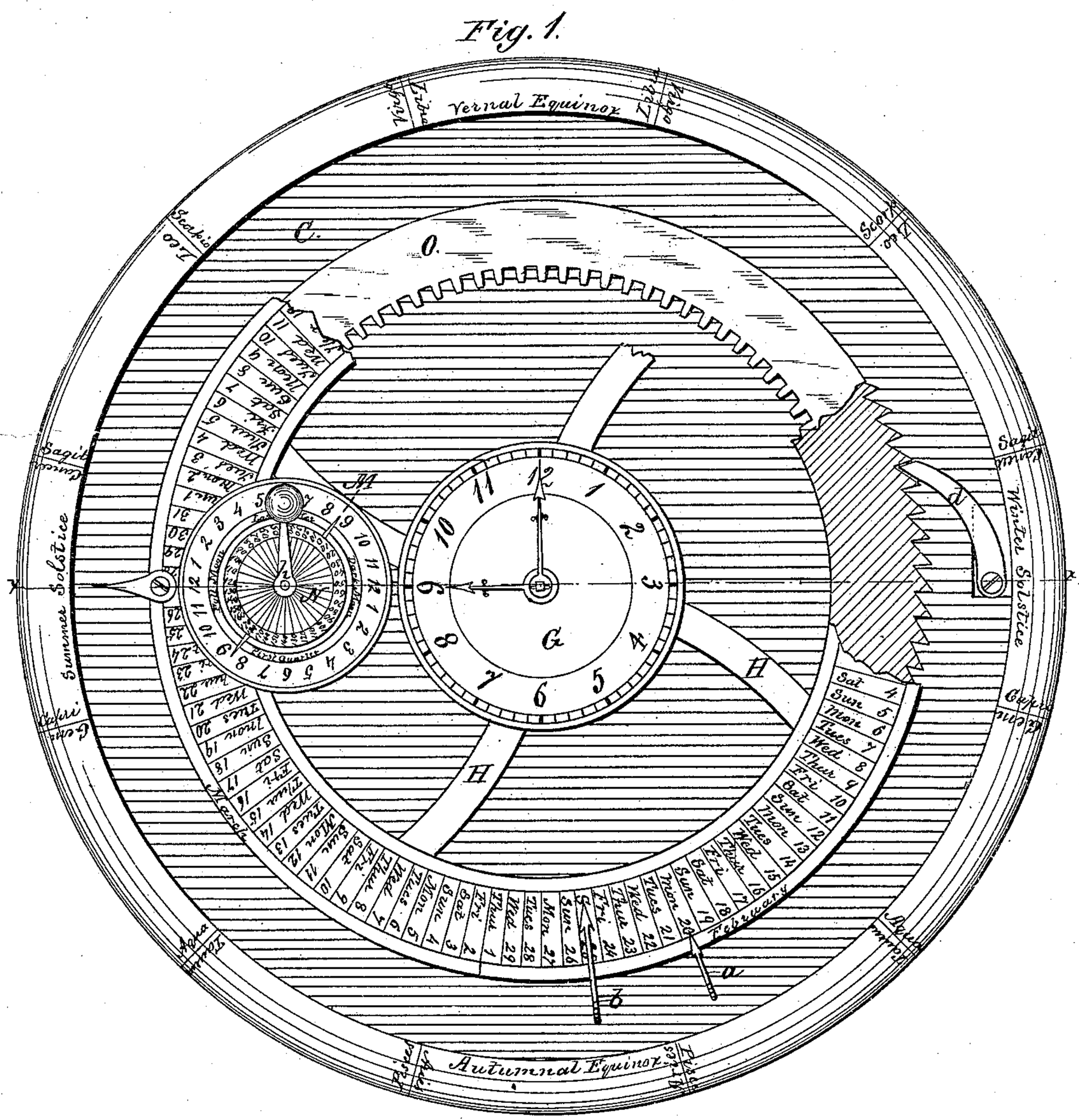
(No Model.) 3 Sheets—Sheet 1.

J. L. BLAIR.

ASTRONOMICAL CLOCK.

No. 246,061. Patented Aug. 23, 1881.

Fig. 1.



WITNESSES:

W. W. Hollingsworth

Edw. U. Byrn

INVENTOR:

Jno. L. Blair

BY Munn & Co

ATTORNEYS.

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Fig. 2.

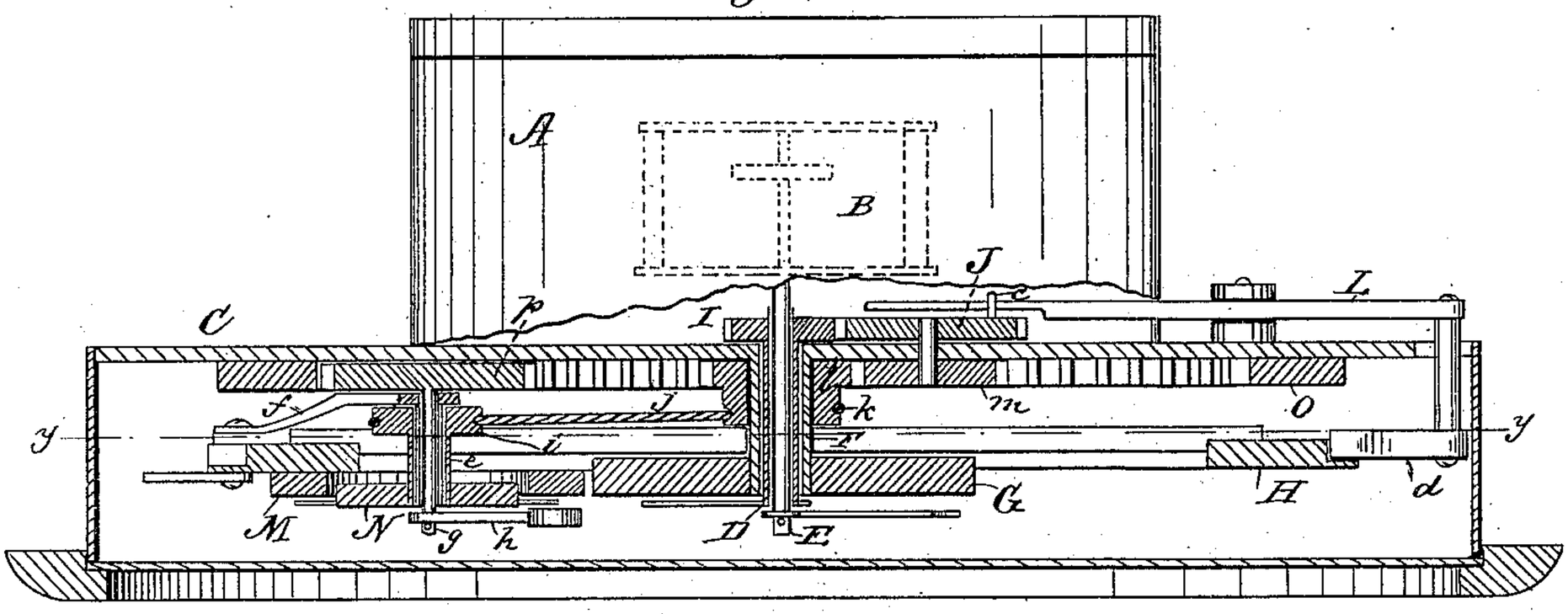
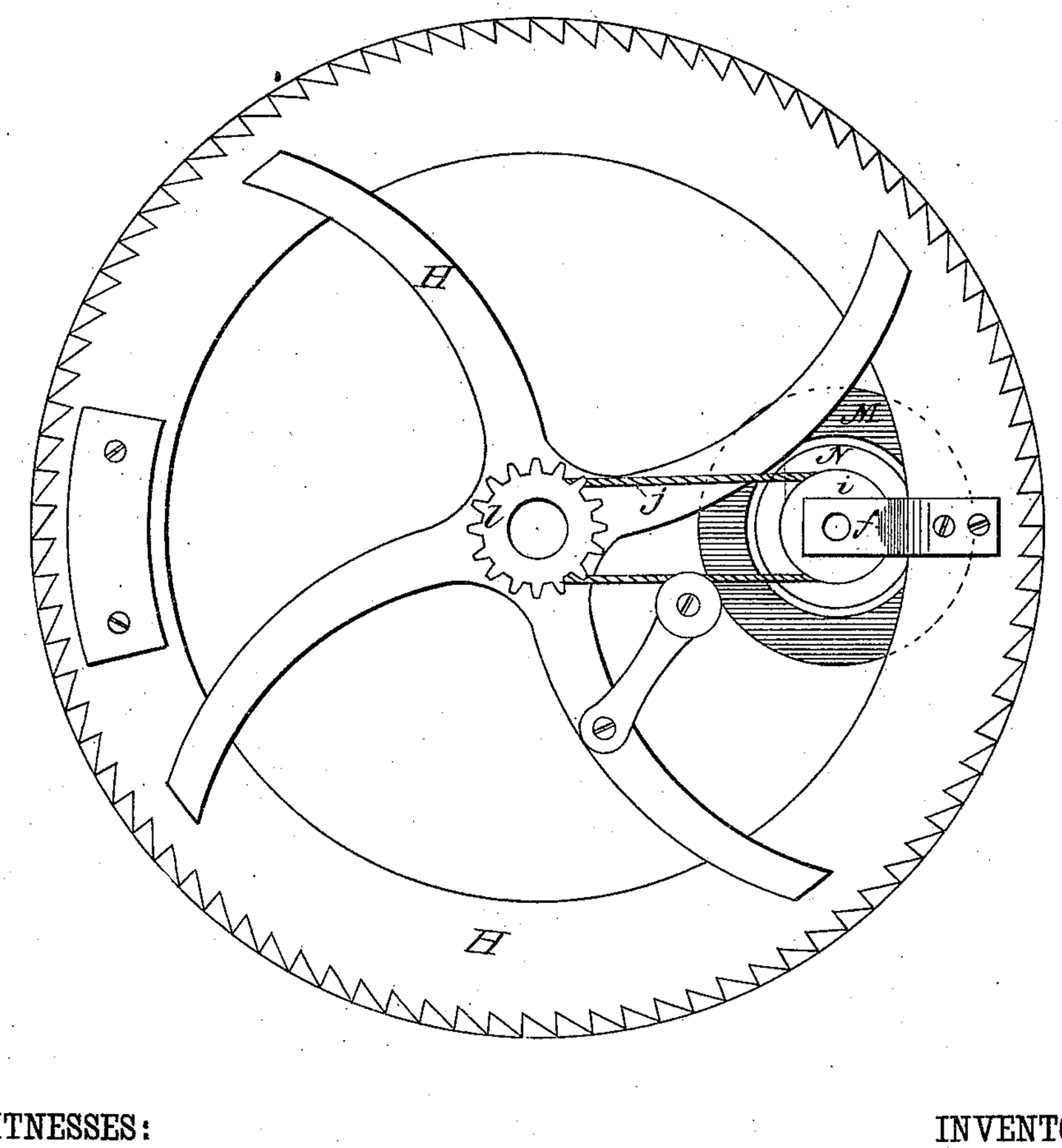


Fig. 3.



WITNESSES:

W. W. Hollingsworth

Edw. C. Byrn

INVENTOR:

Jno. L. Blair

BY Munn & Co

ATTORNEYS.

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Fig. 4.

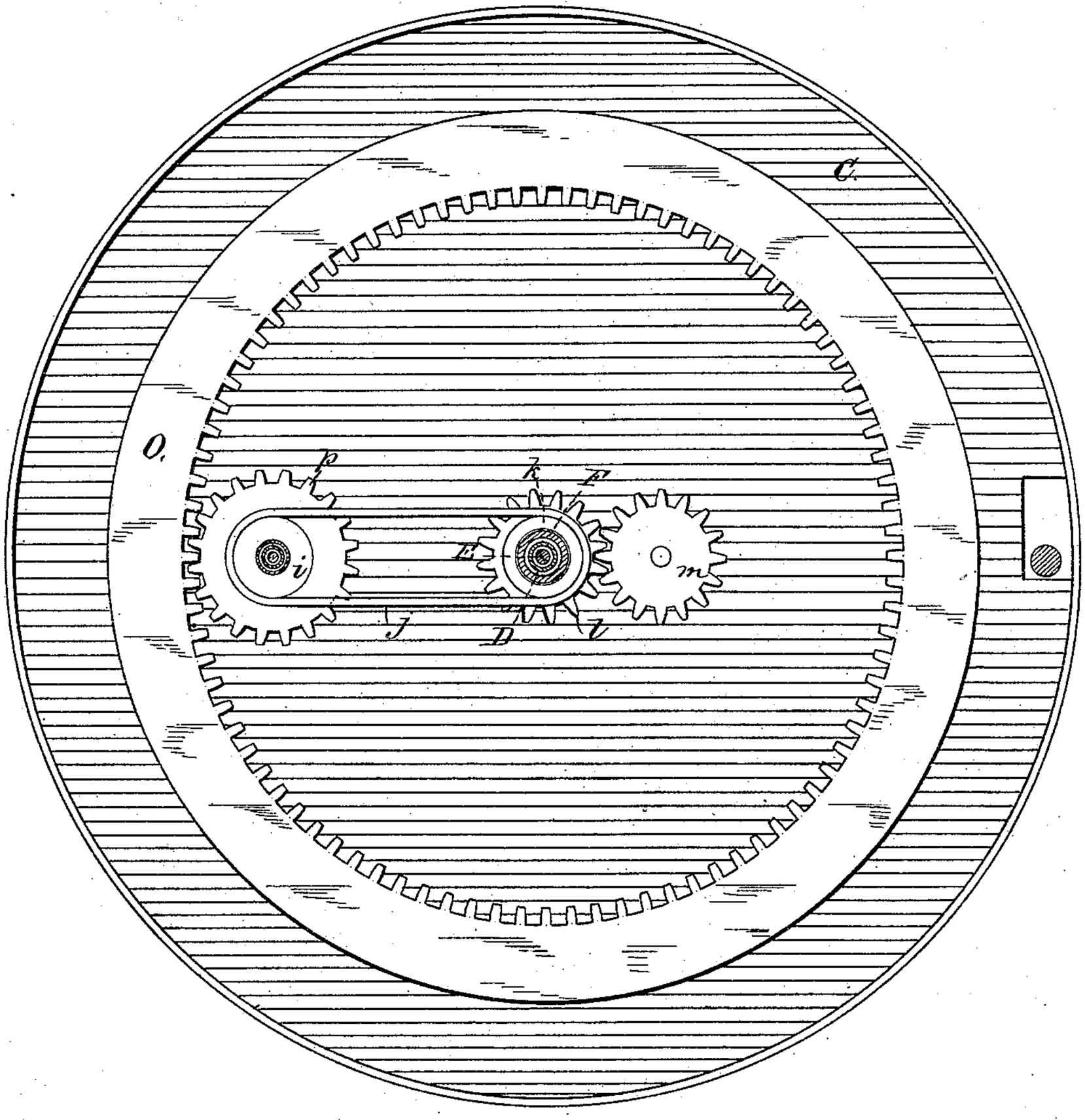
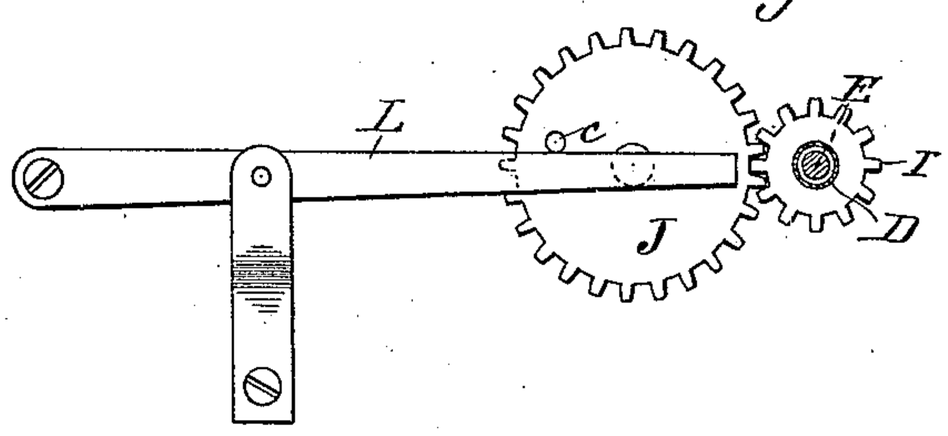


Fig. 5



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INVENTOR:

Jno L. Blair

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN L. BLAIR, OF CLEAR SPRING, MARYLAND.

ASTRONOMICAL CLOCK.

SPECIFICATION forming part of Letters Patent No. 246,061, dated August 23, 1881.

Application filed December 11, 1880. (No model.)

To all whom it may concern:

Be it known that I, Dr. JOHN L. BLAIR, of Clear Spring, in the county of Washington and State of Maryland, have invented a new and Improved Astronomical Clock; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view of the clock with a part of the calendar-wheel broken away. Fig. 2 is a top view with the front part of the clock in horizontal section through the line *x x* of Fig. 1. Fig. 3 is a rear view of the calendar-wheel and the devices attached to it. Fig. 4 is a front view of the inner face of the clock, the view being in section through line *y y* of Fig. 2. Fig. 5 is a detached rear view of the devices for moving the calendar-wheel once every twenty-four hours.

My invention relates to certain improvements in what are known as "astronomical clocks," designed to show by object-lesson the minutes and hours of the day, the day of the week and month, the daily revolution of the earth, the yearly revolution of the earth, the phases of the moon, the time for the different longitudes on the earth, the lunar revolution, the signs of the zodiac, the tides, and synodical as well as periodical time.

To this end my invention consists, generally, in a clock-case and mechanism having in front a separate compartment in which, in the center, is arranged a stationary clock-dial bearing the minutes and hours, and having the ordinary minute and hour hand, which dial, from its concentric position, represents the sun. About this is arranged a wheel which is geared to rotate once a year, and which wheel is laid off as a continuous calendar bearing the days of the week and month, and on which wheel, in eccentric relation thereto, so as to revolve around the sun, is arranged a disk or sphere representing the earth, to which is imparted an independent rotation as it passes around the sun, and about which representation of the earth is a stationary ring laid off with a double set of figures for the hours of night and day, which, with the earth, gives the longitude and time, while the moon is made to revolve around the earth with an independent revolution, and the outer case is laid off with the signs of the zodiac, through which the earth and its moon pass, all as hereinafter more fully described.

In the drawings, A, Fig. 2, represents a clock-case, in which is arranged an ordinary clock mechanism, B; and C is a case arranged in front of the clock-case, in which are contained the moving objects representing the relation of our earth and moon to the sun and the sidereal system.

The ordinary hour-hand sleeve D and minute-hand shaft E of the clock are elongated and made to project far enough in the case C to give room for the attachment of the other parts in rear of the clock-face, and around this sleeve and shaft is fixed a hollow journal, F, which houses the sleeve and shaft and is rigidly fixed to the case, so as to form a firm support for the other parts. Upon the end of this rigid hollow journal F is rigidly fixed the stationary clock-dial G, laid off, as usual, with the hours and minutes in a circle, which are successively pointed out by the hour and minute hand as they traverse this dial. By reason of its central position I make this clock-dial to represent in my invention the sun, about which the other parts revolve.

Upon the hollow journal F, just beneath the clock-dial, is arranged a large wheel, H, turning loosely on said journal, and this wheel has a rim laid off with three hundred and sixty-five and one-fourth days in one continuous circle, subdivided by a regular recurrence of the days of the week in fifty-two divisions, and the proper recurrence of the days of the twelve months, so that one complete revolution of this wheel will constitute a years's time, and its revolution will, with the aid of two pointers or hands, *a b*, Fig. 1, keep a daily calendar throughout the whole year, the pointer *a* terminating in the line of the numerals, and indicating the daily changes in the day of the month, and the pointer *b* terminating in the line of the names of the days of the week, and indicating the daily changes there. To rotate this calendar-wheel, I fix upon the hour-hand sleeve D of the clock a rigid gear-wheel, I, Figs. 2 and 5, and beside it, and gearing into it, I arrange a second gear-wheel, J, which has twice as many

teeth as I, so that every two revolutions of the hour-hand will make one revolution of the wheel J, and so that every revolution of the wheel J will represent one day. Then upon this wheel J, I fix a projecting pin, *c*, and back of the case C, I fulcrum a lever, L, whose end next to the clock mechanism is heaviest, and is arranged to be lifted by the pin on wheel J once every twenty-four hours. The other end of this lever L extends to near the periphery of the case C, and has an arm (see Fig. 2) which passes through a slot in the back of this case, which arm carries a pawl or tooth, *d*, that engages with a series of ratchet-teeth on the periphery of the large calendar-wheel H, Fig. 1. Now, these teeth being in number exactly corresponding to the number of the subdivision on this calendar-wheel, it will be seen that as the clock-gear registers the hours and minutes it also gives an intermittent motion to the calendar-wheel, which indicates the daily changes in the days of the week and month.

To indicate the revolution of the earth on its axis and around its orbit, as well as the revolution of the moon and other principles incidental thereto, I fix to the main wheel H a relatively stationary ring-shaped dial, M, laid off with two sets of figures from 1 to 12, which sets, together, represent the day hours, and also the night hours, and bearing also the phases of the moon. Within this I arrange a disk or globe, N, representing the earth, which is fixed to a tubular axis, *e*, Fig. 2, for independent daily revolution, which axis is carried on a support, *f*, attached to wheel H, for yearly revolution around the sun. Inside of this tubular axis is arranged another axis, *g*, carrying at its upper end an arm, *h*, bearing a disk representing the moon, which has a revolution around the earth.

Now, for giving the earth its independent rotation about its own axis, I place upon the inner end of its tubular axis a grooved pulley, *i*, Figs. 2, 3, 4, which is geared by a belt, *j*, with a grooved pulley, *k*, on the main hollow journal F, and which pulley *k* is fixed to a gear-wheel, *l*, meshing with another, *m*, of equal number of teeth, which latter wheel *m* is fixed upon the same shaft with the wheel J, Fig. 2, on the rear side of case C, so that the wheels *m l* and pulleys *k* and *i* each revolve once in twenty-four hours, giving to the disk or sphere N, representing the earth, a similar revolution in that time. For thus transmitting the motion to the earth for its independent or daily rotation I do not confine myself to the belt-connection, as shown, but may use any suitable gear for that purpose.

To give the proper revolution to the moon, I place on the shaft *g* for the moon a gear-wheel, *p*, which gears with an annular row of teeth, O, fixed to the back of the case C, and the number of the teeth of this wheel *p* are so relatively arranged with respect to the series of teeth O that the number of teeth in O divided by the number of teeth in the wheel *p* will just equal the number of lunar months.

Having thus described the construction of my clock, I will now proceed to show how it indicates the astronomical principles ascribed to it.

The minutes and hours of the days are clearly illustrated by the dial in the center, like any other clock. The days of the week and month are also indicated on the large continuous calendar-wheel in a manner too clear to require further description. The daily revolution of the earth is exhibited by its movement on its individual axis, and its revolution in its orbit by being carried bodily around the sun on the large wheel H.

For the phases of the moon it will be seen that the relatively stationary annular dial around the earth is laid off with a full moon at the farthest point from the sun, dark moon or no moon nearest the sun, and the first and last quarter at points intermediate between the two, so that when the moon is nearest the sun it will be obvious that the dark side will be adjacent to the earth. Then, as it passes around far enough to allow a part of the moon's surface exposed to the sun to be visible from the earth, we have new moon, which increases to the first quarter, and thence until it is directly on the opposite side of the earth from the sun, in which position the full bright side of the moon is adjacent to the earth, and from which point it commences to wane as it approaches the sun again.

For indicating the time at any and all longitudes of the earth at once, the disk representing the earth is laid off with the longitudes, or a globe having the countries themselves may be used, and as it turns inside of the stationary dial the times at the different longitudes will be indicated by the figures on the said stationary dial, the figures nearest the sun giving the time during the day, and the other set on the remote side from the sun the times at night. As the high tides follow the moon, it will be seen that the lunar revolution will show the condition of the tides at the different points on the earth's surface. As the earth, also, in the course of the year, passes around inside the outer rim of the case, the signs of the zodiac, being printed or painted thereon, will serve to indicate the relation of the earth to the sidereal system, the difference between the progressive movement of the earth in its orbit and the earth on its axis serving also to show the difference between synodical time and periodical, or, in other words, the difference between the actual periodical time and the time of the conjunction of the earth with any of the heavenly bodies.

Having thus described my invention, what I claim as new is—

1. An astronomical clock consisting of a clock-case and running mechanism having the hand-shafts elongated, as described, in combination with a dial arranged near the ends of the elongated shafts, and a mechanism representing the revolution of the earth and moon,

arranged behind and around the clock-dial, and in front of the running mechanism, substantially as described.

2. The combination, with a clock mechanism and its dial representing the sun, of a larger concentric wheel representing the earth's orbit, and a disk or globe mounted eccentrically upon the wheel and geared for an independent revolution, substantially as described.

3. The combination, with a clock mechanism and its dial representing the sun, of a larger concentric wheel representing the earth's orbit, a disk or globe mounted eccentrically upon the wheel and geared for an independent revolution, and a fixed annular dial arranged upon the orbit-wheel to move with it, but relatively fixed with relation to the earth, and laid off with divisions for indicating the time at any longitude, as described.

4. The combination, with a clock mechanism and its dial representing the sun, of a larger concentric wheel representing the earth's orbit, a disk or globe fixed eccentrically to the wheel and arranged to revolve about an independent axis, a relatively stationary dial surrounding the earth, laid off with divisions for the hours and phases of the moon, and a representation of the moon arranged eccentrically to the earth, and arranged to revolve upon an independent concentric axis, substantially as described.

5. The combination, with a clock mechanism and its dial, of an eccentric wheel carrying an independently-rotating representation of the earth, and a gearing, substantially as described, connecting the axis of the earth with the central axis of the clock by wheels geared for one revolution in twenty-four hours, as described.

6. The combination, with a clock mechanism and its dial of a concentric wheel carrying an independently-rotating representation of the earth, and an independently-rotating representation of the moon, having a pinion on the lower end of the axis, and a set of gear-teeth, O, fixed on the back of the case, for engagement with the gear-wheel on the moon-shaft, as described.

7. The combination, with a clock mechanism and its dial, of the wheels I and J, having pin *c*, the lever L, having pawl *d*, and the concentric wheel H, having ratchet-teeth on its periphery, substantially as and for the purpose described.

JOHN L. BLAIR, M. D.

Witnesses:
G. CLEM. GOODRICH,
S. M. REITZELL.